

REMARKS

Upon entry of the instant amendment, claims 1, and 3-24 will remain pending in the above-identified application and stand ready for further action on the merits.

In this Amendment, claim 1 has been amended. Support for this amendment can be found in Paragraph [0026] at page 21 of the present specification, which discloses as follows:

[0026]

Furthermore, the phosphazene compounds may be mixtures of the compounds differing in structure, such as cyclic compounds, e.g., cyclic trimers, tetramers and the like and chain phosphazenes, but the processability of flame retardant resin compositions tends to be enhanced with increase of the content of cyclic trimers and tetramers. Specifically, phosphazene compounds containing 80% by weight or more of cyclic trimer and/or tetramer compounds are preferred. More preferred are those which contain 70% by weight or more, more preferably 80% by weight or more of trimers. (Emphasis Added)

Accordingly, the present amendment to claim 1 does not introduce new matter into the application as originally filed. As such entry of the instant amendment and favorable action on the merits is earnestly solicited at present.

Claim Rejections under 35 U.S.C. §§ 102(b) and 103(a)

Claims 2 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Nakacho et al.** (WO 00/09518; which corresponds to US 6,528,559) and further in view of **Harashina et al.** (WO 03/046085; which corresponds to US 2005/0004292). *This rejection is maintained.*

Claims 1 and 3-24 have been rejected under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over **Nakacho et al.**

Reconsideration and withdraw of each of the above rejections is respectfully requested based on the following considerations.

Legal Standard for Determining Anticipation

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). “When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art.” *Brown v. 3M*, 265 F.3d 1349, 1351, 60 USPQ2d 1375, 1376 (Fed. Cir. 2001) “The identical invention must be shown in as complete detail as is contained in the ... claim.” *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

Legal Standard for Determining Prima Facie Obviousness

MPEP § 2141 sets forth the guidelines in determining obviousness. First, the Examiner has to take into account the factual inquiries set forth in *Graham v. John Deere*, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), which has provided the controlling framework for an obviousness analysis. The four *Graham* factors are:

- (a) determining the scope and content of the prior art;
- (b) ascertaining the differences between the prior art and the claims in issue;

- (c) resolving the level of ordinary skill in the pertinent art; and
- (d) evaluating any evidence of secondary considerations.

Graham v. John Deere, 383 U.S. 1, 17, 148 USPQ 459, 467 (1966).

Distinctions over the Cited Art

Rejection of Claim 2

As for the rejection of claim 2, it is noted that claim 2 was canceled in the prior reply of January 15, 2009, and at that time its limitations were incorporated into independent claim 1. However, in the instant amendment the previously incorporated limitations from claim 2 have been canceled from independent claim 1. Accordingly, for these stated reasons the outstanding rejection of prior claim 2 is fully rendered moot.

Rejection of Claims 1 and 3-24

Nakacho et al. and **Harashina et al.** do not describe nor suggest using a phosphazene compound containing 80% by weight or more of cyclic trimers and thereby obtaining a superior processability as the present invention.

The object of the invention of **Nakacho et al.** is to provide a novel phosphazene compound which can greatly improve flame retardancy and to provide a flame retardant which, when incorporated into a thermoplastic resin or a thermosetting resin, does not reduce the molecular weight of the resin and thus does not impair the mechanical properties or heat resistance of the resin. However, it does not describe a flame retardant resin composition having improved processability, which is the advantageous effect of the present invention. Furthermore, the content of the cyclic trimers in a cross-linked phenoxyphosphazene used in the Examples of

Nakacho et al. is 62-75%, which is completely outside the scope of the presently claimed invention (*see independent claim 1*).

The object of the invention of **Harashina et al.** is to provide a flame retardant resin composition having improved flame retardancy without deteriorating appearance properties and hydrolysis resistance of the resin composition. However, it does not describe a flame retardant resin composition having improved processability, which is the advantageous effect of the present invention. In addition, although Example 40 and Comparative Example 11 of **Harashina et al.** may disclose a flame retardant resin composition comprising phenoxyphosphazene, which is a mixture of cyclic trimers and tetramers as B-2, it does not disclose to what extent the cyclic trimers and tetramers are contained.

On the other hand, the flame retardant resin composition of the present invention has the advantageous effect that the processability thereof can be improved by containing 80% by weight or more of cyclic trimers as (B) phosphazene compound, as described in paragraph [0026] at page 21 of the present specification (*see above*). The term processability here means releasability and extrudability specifically.

Please find attached hereto, as **Appendix I**, titled “***Supplemental Experimental Data***” that compares the processability between the phosphazene compounds containing 80% by weight or more of cyclic trimers and less than 80% by weight of cyclic trimers. As clearly understood from the results reported in the attached “***Supplemental Experimental Data***”, the flame retardant resin compositions of the present invention (Examples 40, 55 and 68) were all excellent in extrudability and releasability, while the compositions of Comparative Examples (Reference Examples 1-3) were all inferior in those properties.

Regarding **Appendix I**, the USPTO Examiner is reminded that rebuttal evidence and arguments can be presented in the specification, *In re Soni*, 54 F.3d 746, 750, 34 USPQ2d 1684, 1687 (Fed. Cir. 1995), by counsel, *In re Chu*, 66 F.3d 292, 299, 36 USPQ2d 1089, 1094-95 (Fed. Cir. 1995), or by way of an affidavit or declaration under 37 CFR 1.132, e.g., *Soni*, 54 F.3d at 750, 34 USPQ2d at 1687; *In re Piasecki*, 745 F.2d 1468, 1474, 223 USPQ 785, 789-90 (Fed. Cir. 1984). And that USPTO Examiners should consider all rebuttal arguments and evidence presented by applicants. See, e.g., *Soni*, 54 F.3d at 750, 34 USPQ2d at 1687 (error not to consider evidence presented in the specification). See *M.P.E.P.* § 2145.

In particular, in the enclosed **Appendix**, comparative testing results are discussed and reported (*see pages 5-7*) in **Tables 1-3** thereof (*which are reproduced below for the USPTO's convenience*).

[Example 40, 55, 68. Reference Examples 1-3]

The components were mixed at the ratio as shown in Tables 1~3, and the mixture was fed to a twin-screw extruder of 25 mm in screw diameter in which the maximum temperature of the heating cylinder was set at 200-330°C to carry out melt mixing at a screw revolution speed of 300 rpm, and the resulting strands were cooled and cut to obtain resin composition pellets.

Then, the resulting resin composition pellets were molded by injection molding at 200-330°C to obtain pieces for testing of physical properties, which were subjected to test of physical properties by the test methods as described above to obtain the results of Tables 1~3.

Table 1

	Example 40	Reference Example 1
Fe_3O_4 /part by weight	-	-
(A) P-3/part by weight	-	-
CuO /part by weight	3	3
FR-1/part by weight	15	-
(B) FR-5/part by weight	-	15
PPE-5/part by weight	-	-
PS/part by weight	100	100
HIPS/part by weight	-	-
[UL-94] 1.6 mm	V-2	V-2
Smoke emission at burning	O	x
Extrudability	O	x

Table 2

	Example 55	Reference Example 2
(A) Fe_2O_3 /part by weight	5	5
Fe_3O_4 /part by weight	-	-
(B) FR-1/part by weight	5	
FR-5/part by weight	-	5
PPE-5/part by weight	36.0	36.0
HIPS/part by weight	37.0	37.0
GPPS/part by weight	12.0	12.0
[UL-94] 1/16 inch		
Average firing time/sec	6.4	10.4
Maximum firing time/sec	12.1	25.2
Smoke emission at burning	O	Δ
DTUL/ $^{\circ}\text{C}$	114.7	112.1
Dielectric characteristics [1 GHz]		
Relative dielectric constant	2.63	2.64
Releasability	O	x

Table 3

	Example 68	Reference Example 3
(A) CuO/part by weight	3	3
(B) FR-2/part by weight	15	-
FR-5/part by weight	-	15
PPE-6/part by weight	50	50
PA66/6L/part by weight	50	50
[UL-94] 1.6mm	V-0	V-1
Average firing time/sec	4.0	5.6
Maximum firing time/sec	9.0	13.2
Smoke emission at burning	○	○
Releasability	○	×

Accordingly, based on the above considerations, it is submitted that the flame retardant resin composition of the present invention could not have been easily conceived by one of ordinary skill in the art based on the cited references. Moreover, it is submitted that no reason or rationale is found in the cited art (Nakacho et al. and Harashina et al.) that would allow one of ordinary skill in the art to arrive at the instant invention as claimed, and that as a result, the instant invention is both novel and nonobvious over the cited art of record. Any contention of the USPTO to the contrary must be reconsidered at present.

Conclusion

Based on the amendments and remarks presented herein, the USPTO is respectfully requested to issue a Notice of Allowance in the matter of the instant application clearly indicating that each of instantly pending claims 1, and 3-24 are allowed and patentable under the provisions of Title 35 of the United States Code.

Application No. 10/575,262
Amendment dated July 24, 2009
Reply to Office Action of March 26, 2009

Docket No.: 0152-0730PUS1

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact John W. Bailey, Reg. No. 32,881 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Dated: July 24, 2009

Respectfully submitted,

By 

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Attachment: Appendix I "Supplemental Experimental Data" (7 pages)

Appendix I

W1976-02

Supplemental Experimental Data

<Methods for evaluation of various properties>

1) Flame retardancy

Based on the UL-94 vertical burning test, the flame retardancy was measured. That is, an injection molded test piece of about 1.6 mm thick was used, and when the test piece was allowed to contact with flame ten times, an average firing time was determined, and it was evaluated whether an absorbent cotton caught fire due to drips at the time of firing.

2) Smoke emission at the time of burning

The UL-94 vertical burning test was conducted using a UL burning test chamber (HVUL-C manufactured by Toyo Seiki Seisaku-sho, Ltd.). Evaluation was visually conducted, and the results were graded as "O" when the smoke emitted at the time of the burning test hardly leaked out of the chamber, as "Δ" when a small amount of the smoke leaked out, and as "x" when a large amount of the smoke leaked out.

3) TGA (Thermogravimetric Analysis)

About 10 mg of a sample was heated to 600°C at a rate of 10°C/min in 30 ml/min of nitrogen stream using Thermal Analysis System 7 Series manufactured by Perkin Elmer Co., Ltd., and the difference between the temperature at which weight reduction of 5% occurred and the temperature at which weight reduction of 50% occurred was determined.

4) Measurement of water content

The water content was measured by Karl Fischer's method at a preset temperature of 150°C.

5) Thermal resistance (DTUL (Deflection Temperature under Load)) -Table 2

In accordance with the method of ASTM-D-648, thermal resistance (DTUL)

of a test piece of 6.4 mm thick was measured under a load of 18.6 kg.

6) Extrudability

Melt mixing was carried out by a twin-screw extruder of 25 mm in screw diameter at a screw revolution speed of 300 rpm with setting the maximum temperature of the heating cylinder at the following temperatures.

Example 40, Reference Example 1 - 220°C

The extrudability was visually judged. That is, during melt kneading for 10 minutes, when the strands cut twice or more, this is indicated by "x", when the strands cut once, this is indicated by "Δ", and when the strands did not cut at all, this is indicated by "O".

7) Moisture absorption resistance

A molded piece of about 2 mm thick was moistened in a thermo-hygrostat under the conditions of preset temperature of 85°C and a relative humidity of 95%RH for 64 hours, and the difference in weight before and after moistening was measured. When the value obtained by dividing the difference between the weight after moistening and the weight before the moistening by the weight before moistening and multiplying the resulting quotient by 100 was not more than 2%, this is indicated by "O". when the resulting value was 2-2.4%, this is indicated by "Δ", and when the resulting value was more than 2.4%, this is indicated by "x". The results are used as indications of moisture absorption resistance.

8) Releasability

A dumbbell test piece of ASTM-D-638 was molded by injection molding at the following preset temperature, and degree of releasability of the test piece and runner from the mold was visually judged. Good releasability was indicated by "O", and bad releasability was indicated by "x".

Examples 40 and Reference Example 1: barrel temperature 220°C

Example 68 and Reference Example 3: barrel temperature 260°C

The components used in Examples and Reference Examples are shown below.

(A-1) Metal oxides

(M-6)

Iron oxide (Fe_2O_3 ; manufactured by Wako Pure Chemical Industries, Ltd.)

(M-13)

Cupric oxide (CuO ; manufactured by Wako Pure Chemical Industries, Ltd.)

(B) Phosphazene compounds

(FR-1)

Phenoxyphosphazene comprising 93.6% by weight of a phenoxyphosphazene represented by the formula (14) described on page 56 of the present specification in which n is 3, 4.0% by weight of a phenoxyphosphazene represented by the formula (14) in which n is 4, and 2.4% by weight of a phenoxyphosphazene represented by the formula (14) in which n is 5 or more (5% weight reduction temperature: 336°C; 50% weight reduction temperature: 398°C; residue at 500°C: 4.7% by weight; acid value: 0.17; water content: 182 ppm).

(FR-2)

Phenoxyphosphazene comprising 88.7% by weight of a phenoxyphosphazene represented by the formula (14) described on page 56 of the present specification in which n is 3, 6.2% by weight of a phenoxyphosphazene represented by the formula (14) in which n is 4, and 5.1% by weight of a phenoxyphosphazene represented by the formula (14) in which n is 5 or more (5% weight reduction temperature: 339°C; 50% weight reduction temperature: 404°C; residue at 500°C: 8.7% by weight; acid value: 0.22; water content: 225 ppm).

(FR-5)

Phenoxyphosphazene comprising 75.0% by weight of a

phenoxyphosphazene represented by the formula (14) described on page 56 of the present specification in which n is 3. 12.2% by weight of a phenoxyphosphazene represented by the formula (14) in which n is 4, and 10.8% by weight of a phenoxyphosphazene represented by the formula (14) in which n is 5 or more (5% weight reduction temperature: 326°C; 50% weight reduction temperature: 412°C; residue at 500°C: 15.1% by weight; acid value: 0.45; water content: 362 ppm).

(Resins and other components)

(1) Polyphenylene ether resins

(PPE-1)

Poly-2,6-dimethyl-1,4-phenylene ether having a number average molecular weight (calculated in terms of polystyrene) of 2600 measured by GPC.

(PPE-5)

Poly-2,6-dimethyl-1,4-phenylene ether having a η_{sp}/c of 0.54 measured in a chloroform solution at 30°C.

(PPE-6)

Maleic anhydride-modified PPE pellets were obtained by adding 0.5 part by weight of maleic anhydride to 100 parts by weight of poly(2,6-dimethyl-1,4-phenylene ether) having a η_{sp}/c of 0.41 measured in a chloroform solution at 30°C. kneading and extruding the mixture by a twin-screw extruder at 330°C and 300 RPM.

(2) Rubber-reinforced polystyrene (HIPS)

Rubber-reinforced polystyrene in which rubber content is 9%. η_{sp}/c of the matrix polystyrene is 0.64 measured at 30°C in a toluene solution and volume average rubber particle diameter is 1.5 μm .

(3) Polystyrene (GPPS)

Polystyrene having a η_{sp}/c of 0.8 measured in a toluene solution.

(4) Polyamide resin(PA66/6I)

Polyamide 66/61 resin obtained by polymerization using hexamethylenediamine and 18 parts by weight of adipic acid and 82 parts by weight of isophthalic acid based on 100 parts by weight of adipic acid and isophthalic acid in total.

[Example 40, 55, 68, Reference Examples 1-3]

The components were mixed at the ratio as shown in Tables 1~3, and the mixture was fed to a twin-screw extruder of 25 mm in screw diameter in which the maximum temperature of the heating cylinder was set at 200-330°C to carry out melt mixing at a screw revolution speed of 300 rpm, and the resulting strands were cooled and cut to obtain resin composition pellets.

Then, the resulting resin composition pellets were molded by injection molding at 200-330°C to obtain pieces for testing of physical properties, which were subjected to test of physical properties by the test methods as described above to obtain the results of Tables 1~3.

Table 1

	Example	Reference
	40	1
(A) Fe_3O_4 /part by weight	-	-
P-3/part by weight	-	-
CuO /part by weight	3	3
(B) FR-1/part by weight	15	-
FR-5/part by weight	-	15
PPE-5/part by weight	-	-
PS/part by weight	100	100
HIPS/part by weight	-	-
[UL-94] 1.6 mm	V-2	V-2
Smoke emission at burning	O	x
Extrudability	O	x

Table 2

	Example	Reference
	55	Example 2
(A) Fe_2O_3 /part by weight	5	5
Fe_3O_4 /part by weight	-	-
(B) FR-1/part by weight	5	
FR-5/part by weight	-	5
PPE-5/part by weight	36.0	36.0
HIPS/part by weight	37.0	37.0
GPPS/part by weight	12.0	12.0
[UL-94] 1/16 inch		
Average firing time/sec	6.4	10.4
Maximum firing time/sec	12.1	25.2
Smoke emission at burning	O	Δ
DTUL/ $^{\circ}\text{C}$	114.7	112.1
Dielectric characteristics [1 GHz]		
Relative dielectric constant	2.63	2.64
Releasability	O	x

Table 3

		Example 68	Reference Example 3
(A)	CuO/part by weight	3	3
(B)	FR-2/part by weight	15	-
	FR-5/part by weight	-	15
	PPE-6/part by weight	50	50
	PA66/6L/part by weight	50	50
	[UL-94] 1.6mm	V-0	V-1
	Average firing time/sec	4.0	5.6
	Maximum firing time/sec	9.0	13.2
	Smoke emission at burning	○	○
	Releasability	○	x